Dec. 30, 1947. E. M. ENKUR ET AL 2,433,549

CONTAINER SEALING APPARATUS

Filed Aug. 3, 1940 8 Sheets-Sheet 1

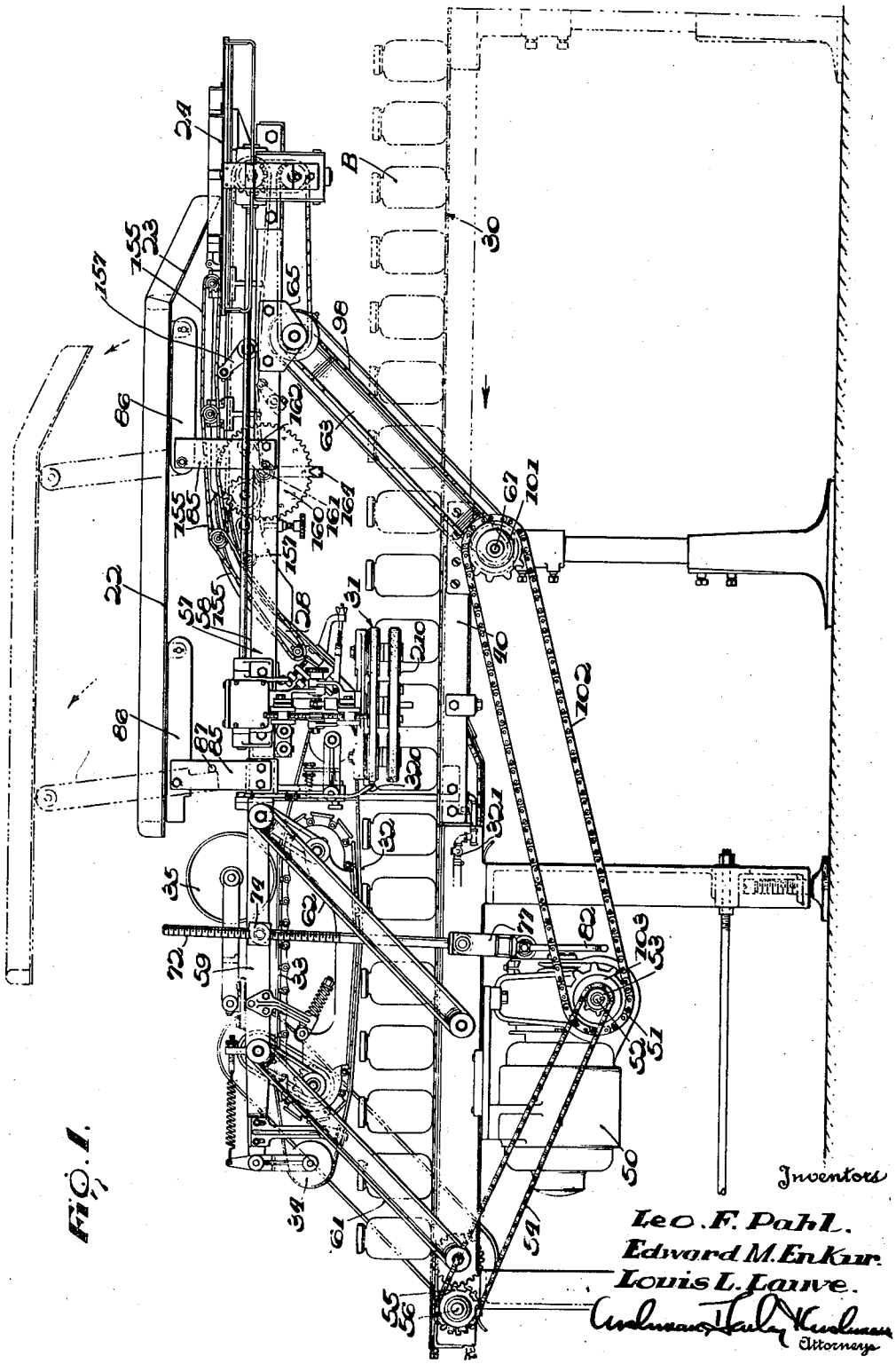

FIG. 1.

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CONTAINER SEALING APPARATUS

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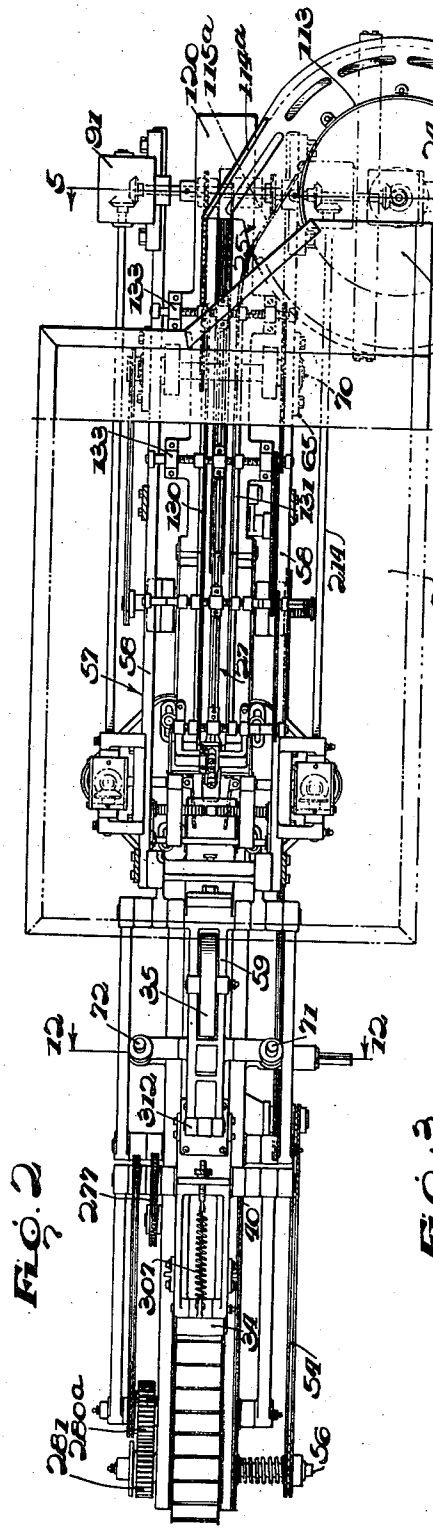

FIG. 2.

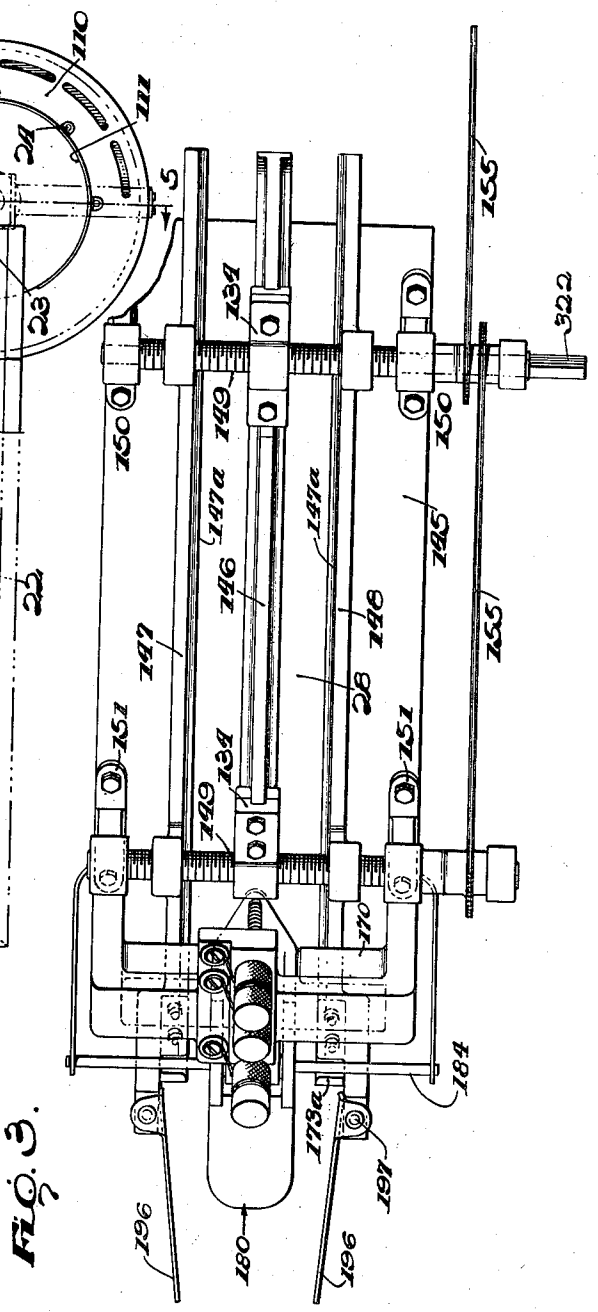

FIG. 3.

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CONTAINER SEALING APPARATUS

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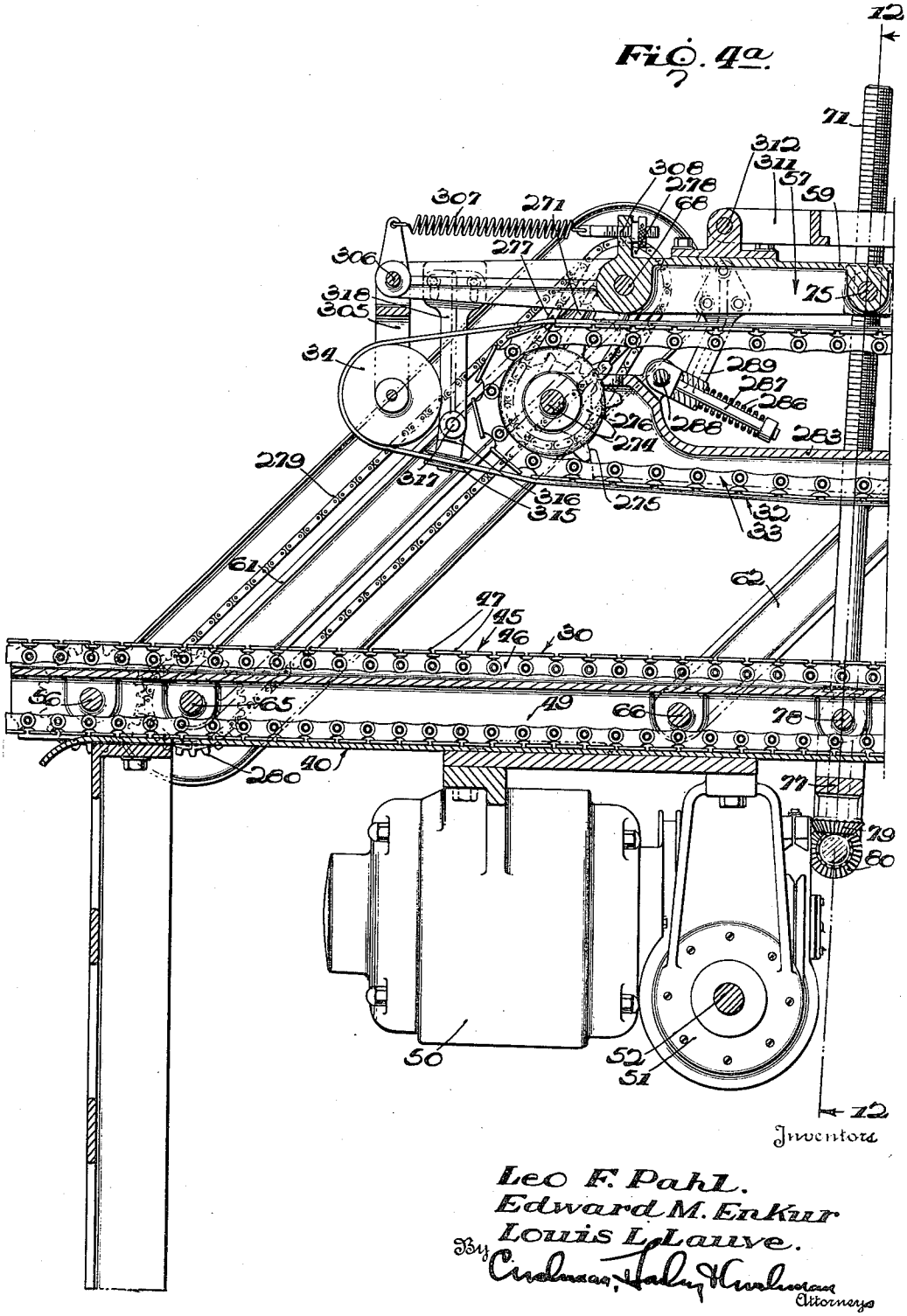
Fig. 4a.



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CONTAINER SEALING APPARATUS

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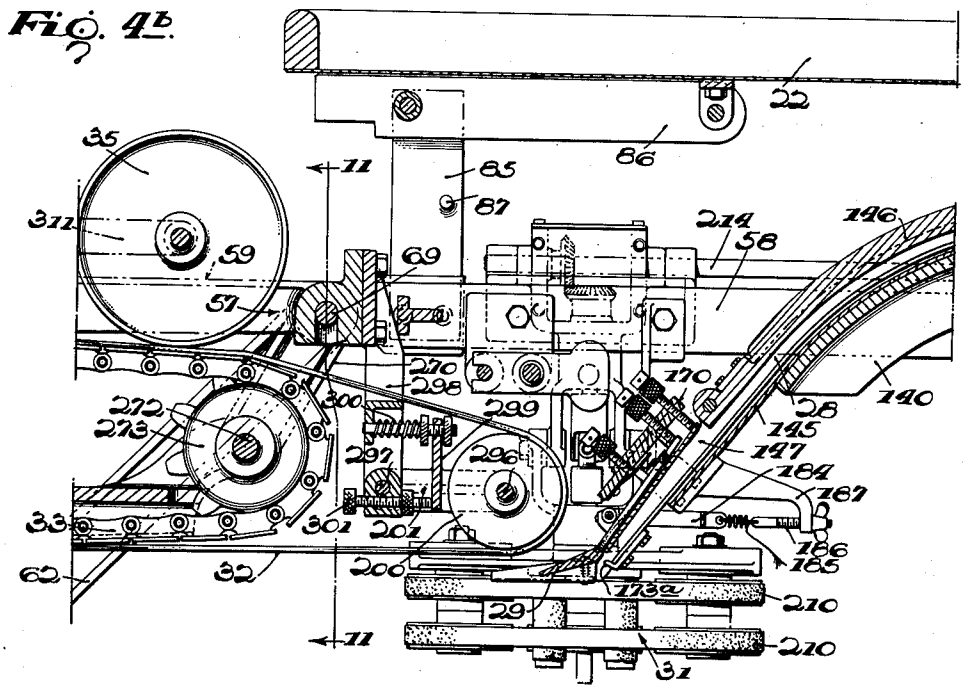
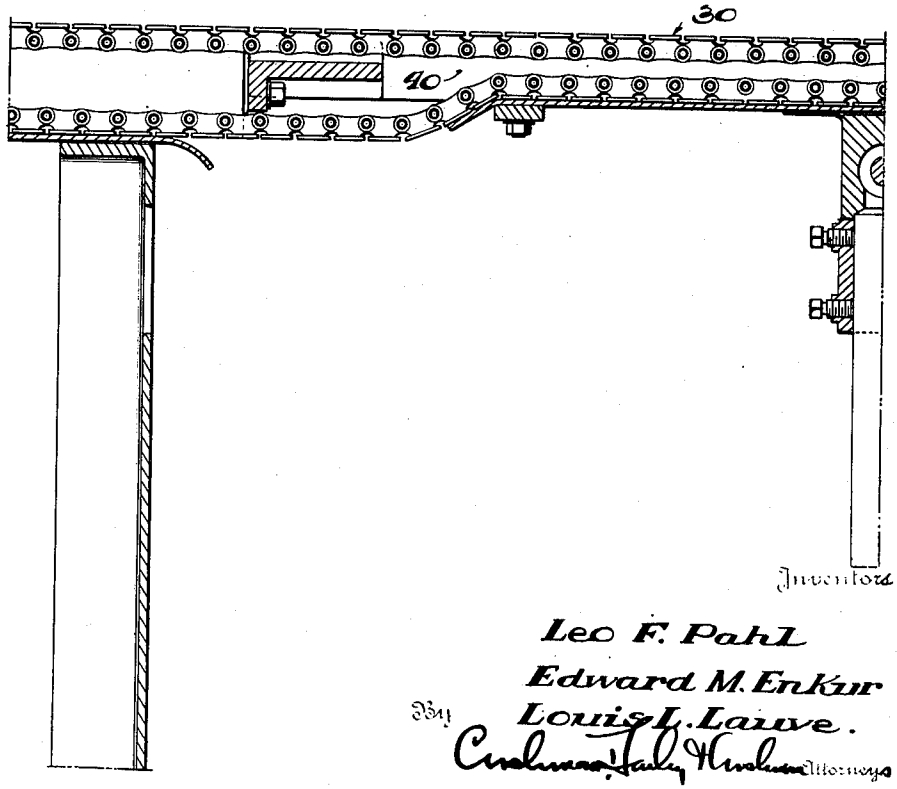
Fig. 4b.





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CONTAINER SEALING APPARATUS

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Fig. 4c

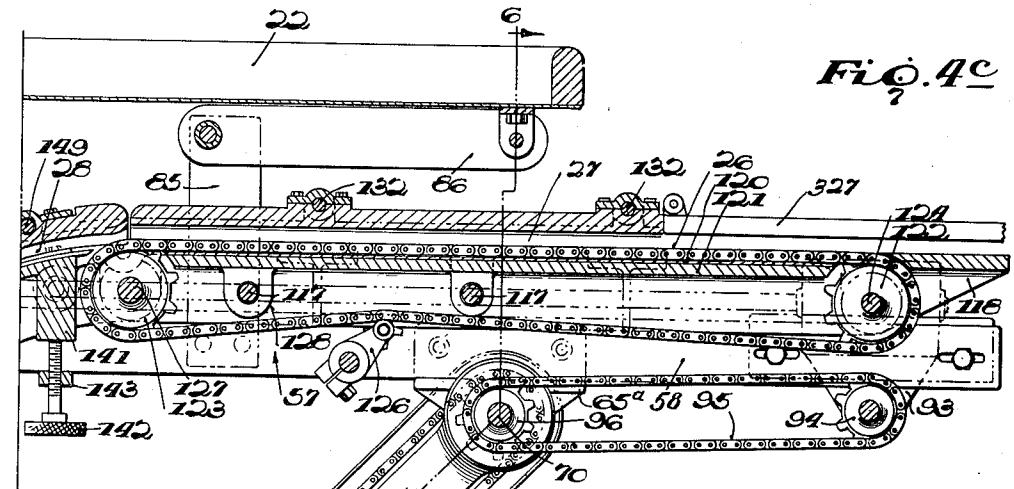
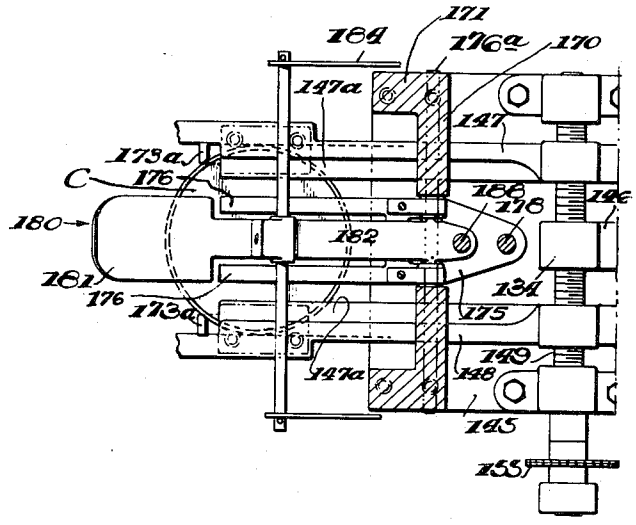


Fig. 13.



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CONTAINER SEALING APPARATUS

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Fig. 5.

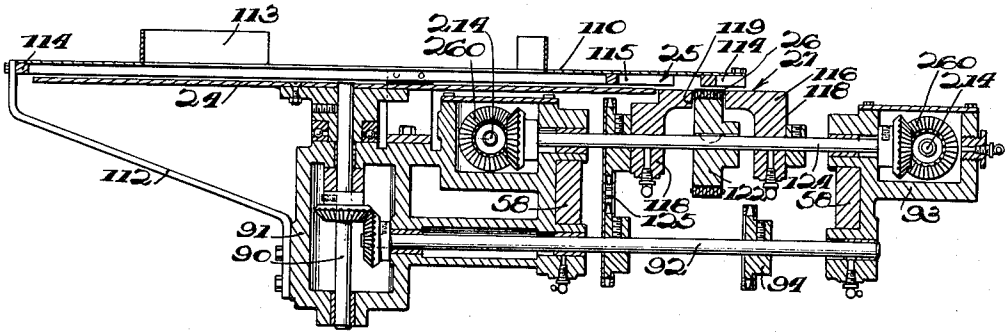
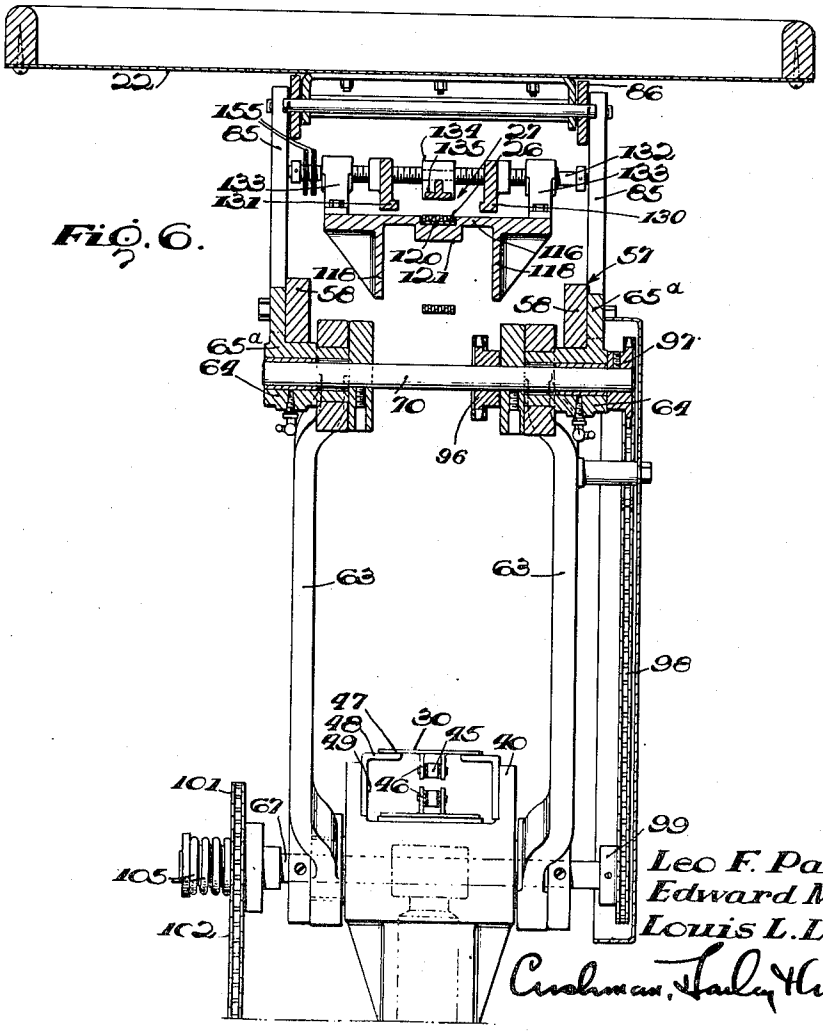


Fig. 6.



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CONTAINER SEALING APPARATUS

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Fig. 7.

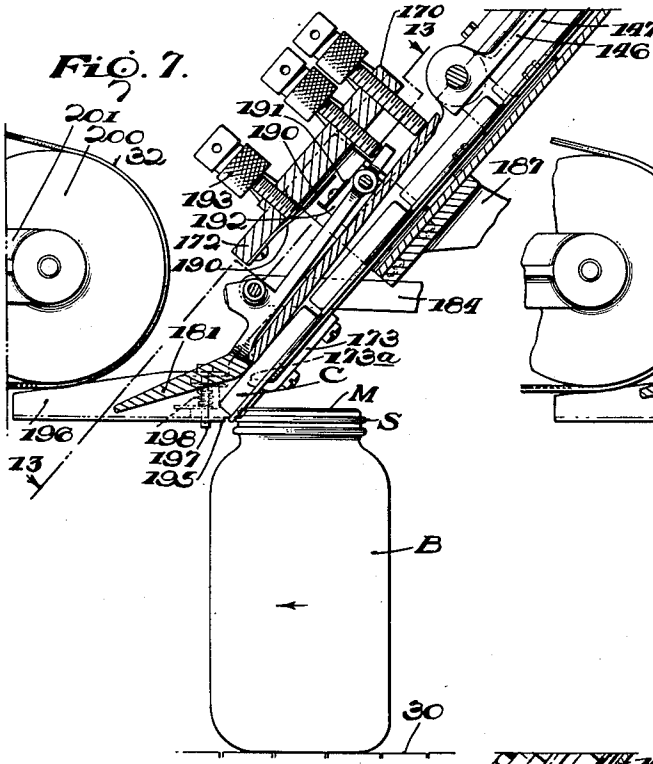


Fig. 8.

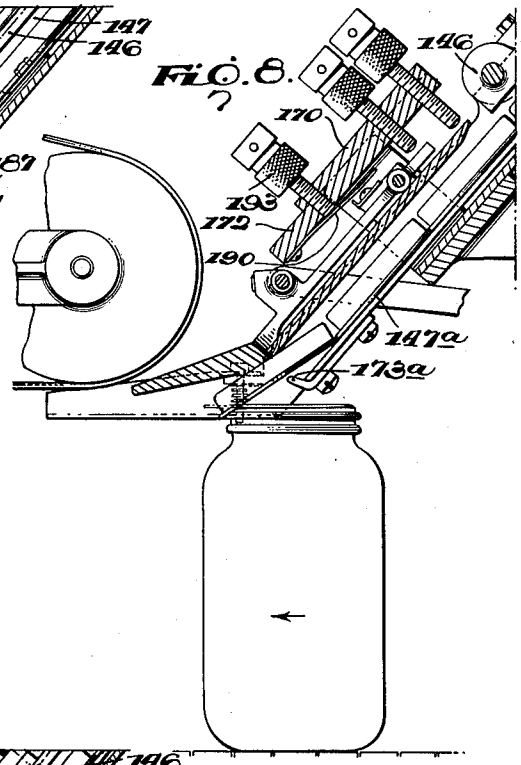


Fig. 9.

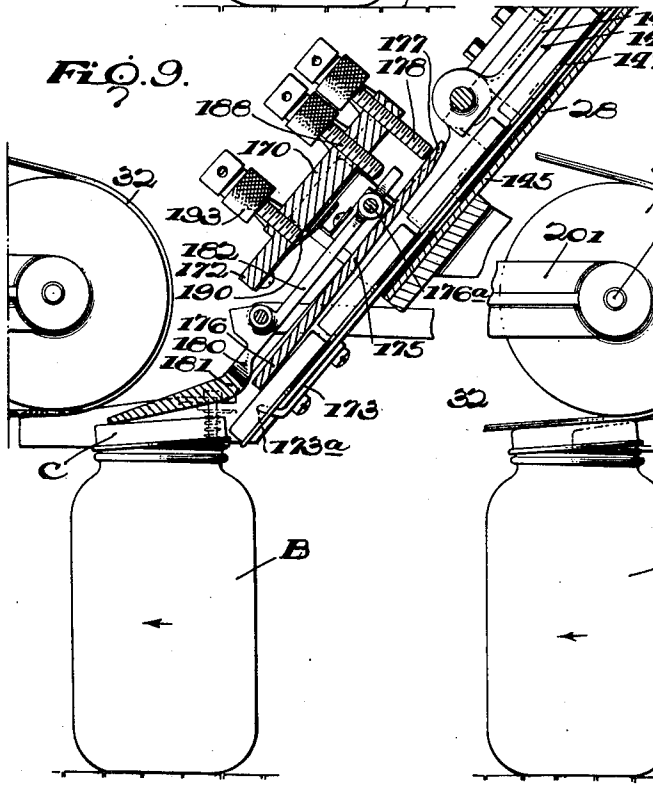
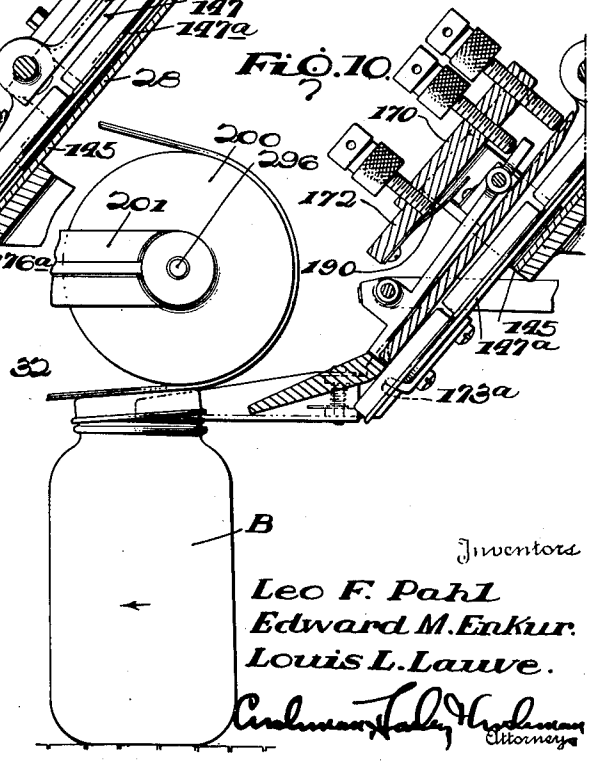


Fig. 10.



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CONTAINER SEALING APPARATUS

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Fig. 11.

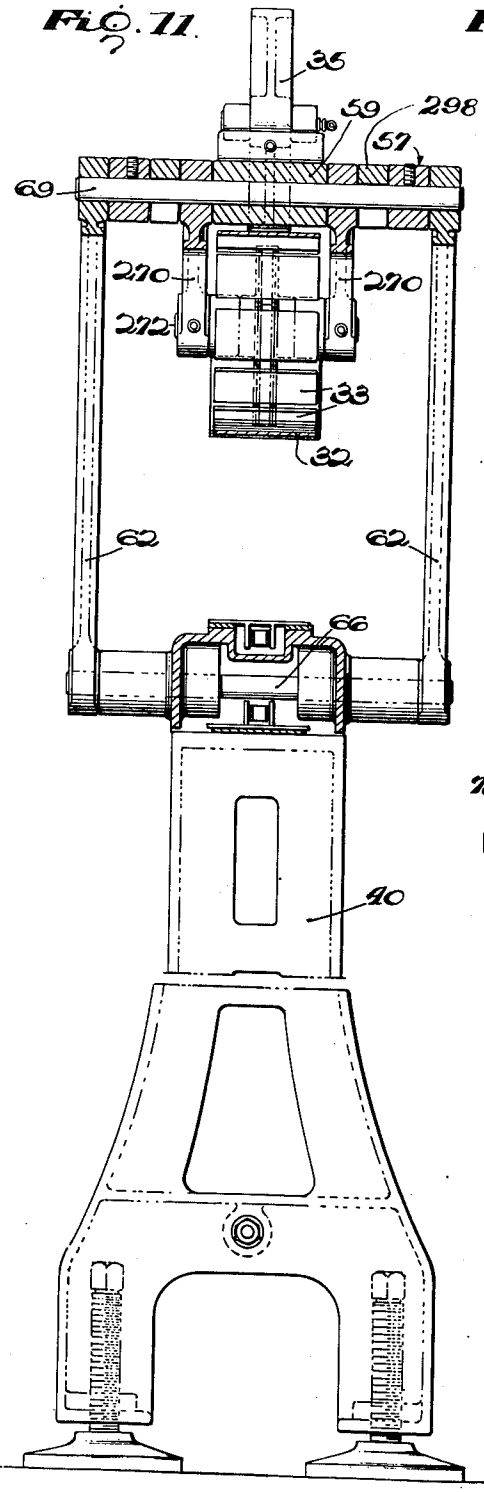
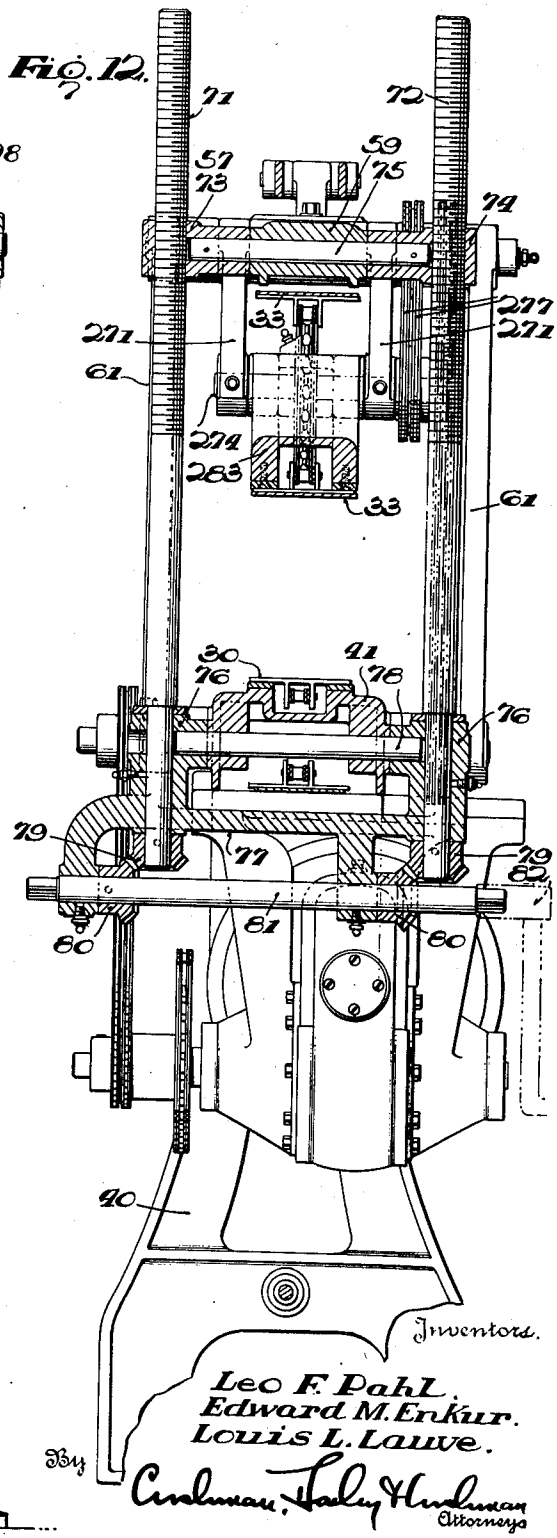


Fig. 12.



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2,433,549

UNITED STATES PATENT OFFICE

2,433,549

CONTAINER SEALING APPARATUS

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Application August 3, 1940, Serial No. 351,004

8 Claims. (Cl. 226—88.1)

1

The present invention relates to container sealing apparatus.

The principal object of the invention is to provide an efficient apparatus for applying a cap to a filled container and then moving the cap to sealed position without interference with the forward movement of the container.

The usual apparatus for applying caps to moving containers for subsequent sealing comprises a belt or the like which moves the filled containers beneath an inclined cap chute positioned at such height that the leading mouth portion of the advancing container will engage the depending or leading portion of the skirt of the downwardly inclined cap. The cap is then released from the cap chute and its trailing portion drops downwardly to a fairly levelled or applied position upon the container mouth.

It will be understood by those skilled in the capping art that the terms "levelled" and "applied," as used above and elsewhere in this specification refer to the position assumed by the cap on the container mouth by its weight alone. In such position, the cap will usually be slightly tilted due to the fact that some points, such as lugs or the like, on the skirt may be of smaller diameter than the outside diameter of the container mouth. However, when levelled upon the container, as is understood in the art, at least the lower edge of the cap skirt is aligned with the cap mouth, even though it may be tilted on the cap mouth.

The arrangement to control the cap during the above applying or levelling operation is of extreme importance because some difficulties are involved in handling the cap during such movement without losing complete control of it. Obviously, if control of the cap is lost during the so-called levelling action, the cap will slide, either forwardly or sidewise, off of the container, or it may move sufficiently far forward upon the mouth of the container that its skirt will not be in substantial circular alignment with the container mouth.

Numerous types of mechanisms have been developed for enabling a cap to be removed from an inclined chute and levelled upon a moving container but most such mechanisms require careful adjustment by experienced operators for each different size of cap. More specifically, most of the prior devices rely principally upon the pressure of the levelling devices to exert exactly the required downward force to control movement of the cap from the tilted position, which it has in the chute, to the substantially horizontal position which it has after being applied to the container, the degree of downward force for differen cap sizes being adjusted by varying either weights or leverage devices. If too much downward force is exerted, difficulty will be involved

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in the initial removal of the cap from the chute by the moving container. On the other hand, if too little downward force is exerted upon the cap, it may slide forwardly and entirely off of the container during the effort to apply it to the container.

The mechanism of the present invention for controlling the movement of caps from an inclined chute to a container exerts an adequate force upon a substantial area of the top wall of the cap throughout the removal and levelling operation, it having been found that caps get out of control during this operation primarily because of the limited contact of the cap with the container throughout the process. More particularly, from the time that the container first contacts with the leading portion of the cap skirt until the cap is levelled upon the container, the only contact between the two is at a central point on their leading edges. The cap thus has a marked tendency to tilt sidewise or slide forward from this single point contact. We have found that if the levelling device acts upon a substantial area of the top wall of the cap, the cap will not tilt sidewise. We further provide adequate pressure to prevent forward sliding of the cap, with means to enable this pressure to be quickly and easily adjusted for caps of different sizes.

Another important feature of this mechanism of our invention is the provision of means to hold the cap upon the container until the subsequent sealing operation. In prior machines, after the cap has been applied or levelled, the container has carried it out of contact with the levelling device and the cap and container move to the sealing device with the cap usually tilted at an angle. At the movement that the cap moves out of contact with the levelling device the latter slides off the trailing portion of the cap and the cap is apt to be tilted entirely off the container. Also, if a capping element of the endless belt or chain type is used, it is possible for an applied cap to be knocked off the container mouth when the leading edge of the cap comes into contact with the continuously moving belt, particularly if the cap is markedly tilted with respect to the container.

Our invention includes means to contact with the cap and firmly hold it upon the container from a time prior to the movement of the cap from the levelling device until it fully contacts with the sealing device.

The above improvement is of substantial value with any combination of levelling device and capping means and is of particular importance in that it removes difficulties heretofore encountered with endless belt capping devices. Endless belt capping devices have substantial advantages over other types due to the fact that containers may be presented to them in irregularly spaced

relation. All other types of capping mechanisms require that containers be presented in exactly spaced or timed relation and in order to obtain this spacing, it is necessary to include a timing device. The use of timing devices is highly objectionable, since they intermittently stop the movement of the filled but uncapped containers and this frequently results in some of the container contents being spilled over the edge of the container mouth, which results in an undesirable condition.

In view of the above, it will be observed that the present invention is designed to so combine cap applying and sealing mechanisms that the caps will be (1) properly applied, (2) held in proper position until sealing, and (3) efficiently sealed upon the containers, all without interrupting the movement of the containers or requiring any timing devices to stop the filled containers.

In its present embodiment, the above-described holding mechanism includes a moving endless belt of bodily flexible material with which a cap applied to a container will contact before such cap leaves the control of the cap applying mechanism. The endless element will then further act to level the cap upon the container and will firmly hold it upon the container until the cap is moved to sealed position.

Another object of the invention is to provide an arrangement whereby caps may be constantly and smoothly delivered to a cap applying means, and which is of such construction that it may be readily adjusted to handle caps of various sizes.

Other objects and advantages of the invention will be apparent from the following drawings wherein:

Figure 1 is a side elevation of the machine;

Figure 2 is a top view of the machine;

Figure 3 is a top plan view of the inclined portion of the cap feeding chute;

Figures 4*a*, 4*b* and 4*c*, taken together, comprise a longitudinal vertical sectional view through a portion of the cap feeding chute, container centering element and the capping element;

Figure 5 is a transverse sectional view on the line 5—5 of Figure 2;

Figure 6 is a transverse vertical sectional view on the angled line 6—6 of Figure 4*c*;

Figures 7 to 10 show the successive action of the cap leveling device in loosely applying a cap to a container.

Figure 11 is a transverse vertical sectional view on the line 11—11 of Figure 4*b*;

Figure 12 is a transverse vertical sectional view on the line 12—12 of Figures 2 and 4*a*; and

Figure 13 is a sectional view of the applying leveling mechanism, taken on the line 13—13 of Figure 7.

In the following description of the invention, the apparatus is described as operating to apply and seal skirted caps such as shown at C in Figures 7 to 10 to containers B having a horizontally projecting shoulder or ring S on their mouths M, the cap skirt being sufficiently resilient that inwardly projecting lugs at the lower end of the cap skirt will engage beneath the shoulder S when the cap is in sealed position. Such caps are provided with a sealing ring or disc on the under side of their top wall to bear upon the top edge of the container mouth M to form an air-tight seal. It will be understood that the apparatus may be used with numerous other types of caps.

The construction and operation of the apparatus may be generally described as follows: Caps C of the type shown in Figures 7 to 10 are placed in tray 22 with their skirts downward and are moved by hand to the inclined chute 23 of the tray so as to slide down upon the central portion of a continuously rotating disc 24. Rotation of the disc 24 in a counter-clockwise direction (Fig. 2) will cause the caps to be moved outwardly on the disc adjacent its periphery and through an outlet portion 25 to move upon a continuously moving endless chain 26 (Fig. 4*c*) which will conduct the cap to the left in Figures 1 and 2 between suitable lateral and top guiding members comprising a cap passageway 27. The cap passageway 27 terminates in an inclined chute 28 (Fig. 4*b*) forming a continuation of the cap passageway. Chute 28 is also provided with lateral and top guide means and terminates in a cap applying or leveling mechanism 29 best shown in Figures 7 to 10.

Containers B are delivered to the machine upon an endless conveyor 30 (Fig. 1) and move toward the left beneath the structure described immediately above to come in contact with the lowermost cap C in the applying or leveling mechanism 29 as indicated in Figures 7 to 10. At the time that the container contacts with the skirt of the lowermost cap, the side walls of the container will be firmly engaged by opposed endless belts included in the container centering mechanism 31 best shown in Figure 4*b* so as to prevent the container from being tilted backwardly as it contacts with the lowermost cap in the chute 28.

Immediately before the cap moves out of contact with the applying mechanism 29, its upper surface will be engaged by an endless fabric belt 32 which further levels and holds the cap upon the container. Belt 32 moves along the outer surface of a capping element 33 of a construction generally similar to that disclosed in the Patent No. 2,256,415, issued September 16, 1941, on an application of Robert J. Stewart for Container sealing apparatus, element 33 being vertically adjustable to operate upon containers of various heights. In order that the fabric belt 32, which is of greater length than the inner capping belt 33, will move at substantially the same speed as the latter belt, a tensioned roller 34 is provided at the outer end of belt 32 and a weighted roller 35 is provided above capping element 33 to hold the upper run of fabric belt 32 in contact with the capping element 33.

Referring in detail to the construction of the apparatus, the machine preferably includes a table or base portion 40 which forms a continuous support for the endless container supporting conveyor 30.

The endless conveyor 30 for supporting containers is of the construction best shown in Figures 4*a* and 6. That is, it is formed of a plurality of pivotally connected links 45, each link including spaced ears 46 which have a plate 47 of substantially greater width than the link integrally formed thereon. The upper run of the conveyor 30 is adapted to have the outer edges of its plates 47 supported upon the inwardly projecting and horizontal portions 48 of angle irons which are suitably spaced to form a channel 49 extending along the table or base 40. As indicated in Figure 6, the lower run of the conveyor moves along the bottom of the channel 49.

Referring to Figure 1, a motor 50 and a speed reducer 51 including a driven shaft 52 are supported upon the under side of the table 40. The

driven shaft 52 of the speed reducer is provided with a small sprocket 53 which drives a sprocket chain 54 also encircling a sprocket 55 fixed to a shaft 56 journalled in the outfeed end of the table 40. The links of the container supporting conveyor 30 move about a sprocket wheel secured to shaft 56.

In order to support the various mechanisms which apply caps and seal them upon the containers at a suitable height above the container supporting element 30, the machine includes a longitudinally extending superstructure 57 shown in Figures 1 and 2 and including spaced bars 58 extending from the infeed end of the apparatus to the capping mechanism, while a plate element 59 comprises the superstructure for the capping mechanism. The superstructure 57 is supported above the table 40 by means of pairs of heavy links 61, 62 and 63 spaced from the outfeed to the infeed end of the machine, each pair of links comprising a link on each side of the supporting table and superstructure. As best shown in Figure 4a, the links 61 are pivotally mounted at their lower ends on a shaft 65 hereinafter described which is provided adjacent the outfeed end of the machine. As shown in Figures 4a and 11, the lower ends of the links 62 are journalled on a pin 66 extending through the side walls of the table 40, while as best shown in Figures 4c and 6, the links 63 are pivotally mounted at their lower ends upon a shaft 67 adjacent the infeed end of the machine. The upper ends of the links 61 (Fig. 4a) are pivotally supported upon a shaft 68 journalled in the superstructure plate 59. Referring to Figure 4b, the upper ends of the links 62 are pivotally connected to pins 69 extending through plate 59 while, as shown in Figures 4c and 6, the links 63 are pivotally mounted on inwardly extending bosses 64 provided on brackets 65a secured to the superstructure bars 58.

It will thus be observed that the links 61 to 63 support the superstructure in parallel relation with the upper surface of the table 40.

In order that the superstructure 57 may be supported at a fixed height and its height adjusted with respect to base 40, the structure shown in Figures 4a and 12 is provided. This construction is similar to that disclosed in said Stewart patent and comprises a pair of rotatable threaded shafts 71 and 72 extending between the base or table and the superstructure. The upper and threaded ends of the shafts 71 and 72 are threaded in collar nuts 73 and 74, respectively, fixed to the ends of a pin 75 which is journalled in the superstructure plate 59. The lower and unthreaded ends of the shafts 71 and 72 are journalled in upward extensions 76 of a bracket 77 which extends beneath table 40. Bracket 77 is pivotally supported with respect to table 40 on a pin 78 extending through the table and into its upward extensions. The journalled portions of the shafts 71 and 72 are reduced so as to provide a shoulder bearing upon the upper surface bracket extensions 76 as shown in Figure 12. The extreme lower ends of the shafts 71 and 72 are provided with bevelled pinions 79 which mesh with spaced bevelled pinions 80 fixed to a cross shaft 81 journalled in downward extensions of bracket 77. Both ends of the shaft 81 are squared to receive a crank 82 indicated in dotted lines in Figure 12.

It will be noted that by the above construction, rotation of shaft 81 will cause the threaded shafts 71 and 72 to simultaneously rotate with respect to the nuts 73 and 74 so that the entire superstructure may be raised or lowered, the links 61 to 63 holding the super-structure parallel to the surface of the supporting conveyor 30 and table at any point to which the super-structure may be elevated. The threaded drive included in the above gearing will rigidly hold the super-structure in any position.

The tray 22 upon which caps are placed by the operator for subsequent movement through the apparatus is flat with upstanding side walls and the inclined chute portion 23 through which the caps are moved by the operator to the disc 24 is rigid with the remainder of the tray. Tray 22 is normally in the position shown in solid lines in Figure 1, with its bottom wall resting upon upstanding elements 85 secured to the super-structure bars 58. In this position, the lower edge of the downwardly inclined outfeed portion 23 is immediately above the surface of the rotating disc 24 so that when the group of caps in the tray 22 is moved toward and down inclined chute 23, the caps will slide directly onto the disc. In order that the operating parts of the machine which are immediately beneath the tray 22 will be accessible for adjustment, the tray 22 is connected to the elements 85 by pairs of links 86. One end of each link is pivotally connected to the associated upstanding element 85 as indicated in Figure 1 and the opposite end thereof is pivotally connected to a lug extending downwardly from the tray. The tray may thus be swung upwardly to the dotted line position shown in Figure 1, being maintained in this position by reason of the fact that the lower ends of one or more of the links 86 are lengthened to contact with a stop pin 87 provided on an upstanding element 85.

The rotating cap feeding disc 24 has the function of arranging the caps in a linear formation and, as best shown in Figure 5, is supported upon a central downwardly extending shaft 90 journalled in a casing 91 secured to one of the superstructure bars 58 at the infeed end of the machine. Shaft 90 is connected by bevel gearing to a horizontal and transverse shaft 92 journalled in the casing 91 and in a bracket 93 secured to the other super-structure bar 58. Shaft 92 has a sprocket wheel 94 fixed thereto which, as best shown in Figure 4c, is driven by a sprocket chain 95 extending about a second sprocket wheel 96 on the shaft 70. Shaft 70 is journalled within the brackets 65a to which the links 63 are pivotally connected. Both casings 91 and 93 are held upon the bars 58 in a manner to permit of longitudinal adjustment to adjust the tension of chain 95. Shaft 70 also has fixed thereto a sprocket wheel 97 engaged by a sprocket chain 98 driven through a sprocket wheel 99 fixed to shaft 67. Shaft 67 is provided at its opposite end with a sprocket wheel 101 driven by a sprocket chain 102 which, as best shown in Figure 1, is directly driven by a sprocket wheel 103 on the driven shaft 52 of speed reducing mechanism 51.

As indicated in Figure 6, an overload clutch 105 may be provided on the shaft 67 to prevent damage to the drive in the event that a jam occurs.

As best shown in Figures 2 and 5, a cover plate 110 is mounted above the disc 24, the cover plate being cut out at its central portion as indicated at 111 to permit caps moving downwardly through the inclined chute 23 to drop upon the central portion of the disc. The cover plate is supported at a height above the disc very slightly greater

than the height of the caps by means of arms such as 112 secured to the fixed casing 91. An upwardly projecting flange 113 is formed at the edge of the central cut out 111 of cover plate 110 in order to brace the same and also to prevent caps from sliding up upon the cover plate.

In operation, the disc 24 is rotated at a sufficiently high speed that caps dropped upon the same from the chute 23 will be moved by centrifugal action toward the periphery of the disc and into contact with a depending flange 114 at the outer edge of the cover plate (Figure 5). Caps thus positioned will move along the outer side of a depending flange 115 spaced inwardly from flange 114 at a distance slightly greater than the diameter of the caps being handled. The inner flange 115 preferably extends about one-half of the diameter of disc 24 and is aligned with a finger 115a (Figure 2) pivoted on a side guide strip 131 hereinafter described as forming part of passageway 27. The outer flange 114 extends to an arm 114a pivoted on the infeed end of a side guide strip 130 hereinafter described as a part of passageway 27.

It will be noted that the elements 114a and 115a define an outlet path 25 along which the caps move from the disc 24 to the passageway 27, tangential to the disc and preferably at an angle to the passageway 27.

Referring to Figures 5 and 4c, a plate 116 is pivotally supported adjacent its infeed end on a transverse shaft 124, and the other end of plate 116 includes an extension 140 (Figure 4b) to which the chute 28 is fixed. Extension 140 is provided with a downwardly projecting lug 141 which rests upon the upper end of a hand screw 142 threaded in a cross-bar 143 fixed to super-structure bars 58. As is also shown in Figure 6, the central portion of plate 116 is longitudinally grooved and the upper run of endless chain or drag element 26 moves in this groove, this run of the chain bearing upon a hardened sheet 120 bearing upon the bottom wall 121 of the groove.

The upper surface of the top run of chain 26 projects very slightly above the surface of the plate 116 so that the chain will exert a dragging action upon the depending skirts of the caps in order to move the same. The chain or element 26 is of metal link construction, the links being of such form that no sharp projections will be presented against the cap skirts. By this arrangement the chain may continuously move freely beneath a line of stopped caps without marring them but will nevertheless move them forwardly if their movement is not impeded. Chain 26 moves about sprocket wheels 122 and 123 mounted in slots 119, wheel 122 being the driving wheel and being mounted upon the shaft 124 (Figure 5) which is journalled in the depending flanges 118 of plate 116 and is also journalled in the casings 91 and 93. Shaft 124 is driven from the shaft 92 (Figure 5) by a sprocket chain 125. Figure 4c illustrates a tensioning device 126 which acts upon the lower run of the chain 26. The shaft 127 which carries the idler sprocket 123 is suitably mounted in the super-structure bars 58.

As is described in our divisional application for Container capping apparatus, Serial No. 562,110, filed November 6, 1944, the plate 116 forms the bottom wall of the cap passageway 27 and in order to define its side walls, two guide strips 130 and 131 shown in Figure 6 are supported above the plate. These strips guide the caps from the fingers or arms 114a and 115a to a point adjacent the chute 28 of the cap passageway 27 and, as best shown in Figures 2 and 6, are supported upon threaded shafts 132 journalled in trunnions 133 secured to the upper surface of plate 116. The shafts 132 are reduced at their central portion to support apertured carriers 134 having top guide strips 135 secured to their lower surfaces by bolts. As indicated in Figure 4c, the carrier 134 nearest the infeed of passageway 27 pivotally carries a top gate 327 through which upside-down caps may be removed from the passageway. The free end of gate 327 rests on the cover plate 110 of disc 24.

The top guide strips 135 and gate 327 are positioned at such height with respect to the chain 26 that they will prevent caps from climbing upon each other under the action of the chain. Since the top guide strip 135 is simply secured to the carrier lugs 134 by screws, strips of different vertical thickness may be readily provided upon the machine to coact with caps of different height. The portions of the shafts 132 immediately beyond the reduced central portion are threaded in opposite directions and the side guide strips 130 and 131 are carried on these oppositely threaded portions so that rotation of the shafts 132 will cause the side strips to simultaneously move either toward or away from each other to centrally position caps of various sizes upon the plate 116. The manner in which the shafts 132 are rotated is hereinafter described.

As best indicated in Figures 4b and 4c, considered together, caps moving off the chain 26 are directed into the inclined chute portion 28 of passageway 27. Chute 28 is fixed upon the extension 140 of plate 116. As has been heretofore stated, extension 140 includes a depending lug 141 having its lower surface in contact with the upper end of the hand screw 142. Rotation of hand screw 142 will cause plate 116 to swing on shaft 124, thereby varying the height of the lower end of chute 28. The upper surface of extension 140 is curved downwardly from plate 116 and supports a correspondingly curved plate 145 which extends downwardly past the lower edge of the extension 140. A top-guide strip 146 and side guide strips 147 and 148 are supported in proper relation to the bottom plate 145 upon shafts 149 journalled in longitudinally spaced pairs of trunnions 150 and 151 fixed to the plate 145. As best shown in Figure 3, the mounting of the top guide strip 146 and the side guide strips 147 and 148 is generally similar to that described above in connection with the top and side guide strips 134 and 130 and 131 used in connection with the horizontal plate 116. That is, the top guide strip 146 may be removed and a strip of different thickness secured to its carriers 134 and the side guide strips 147 and 148 may be simultaneously moved toward or away from each other by rotation of the oppositely threaded shafts 149.

In order that the side guide strips 130 and 131 and 147 and 148 may all be simultaneously adjusted together, the shafts 149 associated with the inclined chute 28 and the shafts 132 associated with the horizontal portion of passageway 27 are connected by sprocket chains 155 moving about small sprocket wheels on the shafts, the arrangement being such that a sprocket chain connects each adjacent pair of shafts, three sprocket chains being used to connect all of the shafts. In order that the two end sprocket chains 155 will be held under proper tension, suitable tensioning devices 157 shown in Figure 1 are mounted on rods 117 in super-structure bars 58 so as to bear against the lower runs of these two chains 155.

In order that the position of the side guide strips 130 and 131 and 147 and 148 may be readily changed to a proper position for any desired size of cap, the end of shaft 149 of Figure 3 is squared as at 322 to receive an operating handle. The lower run of the central chain 155 is engaged by a large sprocket wheel 160 illustrated in Figure 1 which serves to tension that chain. Wheel 160 is journalled upon a stud 161 suitably supported from the super-structure bars 58. The wheel is provided with numbered indicia corresponding to the standard sizes of the caps and the arrangement is such that when any number upon the wheel 160 is aligned with a fixed pointer 164, the series of side guide strips will be positioned to properly guide caps of that size along the passageway 27 including chute 28.

Referring to Figure 3 and to Figures 7 to 10 and 13, at its lower end the plate 145 has secured to its upper surface a bracket 170 which is of generally inverted U-shaped form including depending side legs 171 and a top plate 172. The side guide strips 147 and 148 associated with chute 28 include inwardly projecting flanges or ledges 147a at their lower edges upon which the edges of the caps move during their travel down the inclined chute. The side strips 147 and 148 extend through the bracket 170 and on past the edge of the base plate 145 and the lower ledge 147a of each side strip has an angled stop plate 173 secured to its extreme lower portion, an upwardly bent portion of the plate extending upwardly on an angle past the upper surface of the ledge with the result that a stop 173a is provided at the lower end of each side guide strip. Because the plates 173 are carried by the side strips 147 and 148, their upward extensions or stops 173a will contact with the cap skirts at a point only slightly in advance of the transverse diameter of the cap as indicated in Figure 7 and a substantial portion of the cap will project past the stops 173a.

In order to hold the lowermost cap in chute 28 downwardly into contact with the lower ledges 147a of the side strips and also to assist in leveling the cap upon a container, a presser 175 is pivoted on a pin 176a between the vertical legs 171 of the bracket 170. As shown in Figures 9 and 13, presser 175 includes two fingers 176 extending downwardly from its pivot to a point adjacent the stops 173a and the lower ends of these fingers bear upon the top surface of the lowermost cap in the chute. An upward extension 177 projects beyond the pivot of element 175 and a set screw 178 threaded in the plate portion 172 of bracket 170 contacts with the upper surface of this extension to limit its upward swinging movement and thereby limit the downward movement of the fingers 176. The weight of the fingers 176 is sufficient to hold the lowermost cap downwardly against the stop elements 173 against the weight or tendency of the other caps in the chute to force the lowermost cap over the stop elements. However, the fingers 176 will lift with the lowermost cap when a container raises the caps above the stop elements as shown in Figure 8 and as hereinafter described.

In order that the lowermost cap will be substantially leveled upon the container which removes the same from the chute 28, a wiper element 180 is also pivotally mounted upon the pin 176a. As best shown in Figure 13 the wiper 180 includes a tongue portion 181 arranged at an angle to a bar portion 182, the bar portion being provided with an aperture to surround the pivot pin 176a. The bar portion 182 lies above and between the fingers 176 of presser element 175 while the tongue portion 181 is positioned beyond the fingers 176 of presser element 175 but inclined upwardly from the fingers. As illustrated in Figure 7, when the lowermost cap in the chute is in contact with the stop elements 173a, the extreme rearward portion of tongue 181 will bear upon the top wall of the cap. Wiper element 180 is urged to this normal position by means of a spring loaded yoke 184. As shown in Figure 4b, yoke 184 has a spring 185 connected to its free end, the opposite end of the spring being secured to a threaded stud 186 mounted in a bracket 187 carried on an under side of the chute base plate 145.

The upward movement of the extreme upper portion of the wiper 180 is limited by a set screw 188 threaded in the top plate 172 of bracket 170.

In order that the upward swinging movement of the presser 175 will be resiliently limited, a leaf spring 190 is fixed on top wall 172 of bracket 170 in a position to contact with the upturned edge of a metal plate 191 fixed to lugs 192 on the fingers 176 of presser 175. The plate 191 is mounted below the pivot 176a of the presser element 175 so that it will contact with the spring 190 when the presser is raised by the upward tilting of a cap above the stop elements 173, as shown in Figure 8. The tension of the spring 190 is adjusted by means of a set screw 193. In order to center the caps with the containers as the caps are withdrawn from the cap chute 28, the lower portions of the side guide strips 147 and 148 are angled as indicated at 195, and arms 196 are pivoted upon these extensions by means of pins 197. The free ends of each of the arms 196 are urged toward each other by means of a light coil spring 198 suitable mounted on the pins.

The operation of the presser 175 and wiper 180 during the removal of the lowermost cap is illustrated in Figures 7 to 10. Referring to Figure 7, the lowermost cap in the chute normally rests against the stops 173a, which are at the extreme lower end of the cap carrying edges 147a of each side strip 147 and 148, the height of the lower end of the chute 28 with respect to the container supporting conveyor 30 being so adjusted by operation of the thumb screw 142 that the depending leading portion of the skirt of the cap C will be engaged by the leading portion of the mouth M of the container B. It will be observed that because the cap supporting ledges 147a terminate at the stops 173a, a clear path for the movement of the containers will be provided below the stops.

When the cap is in the above described position the fingers 176 of the presser element 175 will bear against laterally spaced points very slightly in advance of the transverse diameter of the cap, this contact of the fingers being merely a point contact. In other words, the extreme lower corners of the spaced fingers have contact with the top wall of a cap along a transverse line very slightly in advance of the transverse axis of the cap. At the same time, the extreme upper edge of the lower surface of wiper tongue 181 will bear upon the top wall of a cap immediately in advance of the fingers. This portion of the tongue is rounded so that the cap may rock beneath the same, as hereinafter described.

As indicated in Figure 8, during the initial portion of the removal of a cap C from a chute, the lower portion of the cap will be tilted upwardly so that its skirt will be entirely clear of the stops 173a, the trailing portion of the skirt of the cap simultaneously sliding downwardly on the ledges 147a. The upward tilting of the cap will cause the

presser fingers 176 and the wiper tongue 181 to be raised, but immediately the skirt of the cap clears the stops 173a, the edge of plate 191 on the fingers 176 will contact with the leaf spring 190 so as to exert a stronger downward pressure on the cap. This pressure, together with the pressure now exerted by wiper tongue 181, due to the action of coil spring 185, will prevent the cap from sliding forwardly and off of the container. Thus, the leading portion of the skirt of the cap will be held in firm contact with the leading portion of the mouth of the container.

As soon as the container has drawn the cap entirely forwardly of the stops 173a, that is, to a position just forwardly of that shown in Figure 8, the cap will be moved downwardly upon the container to the position shown in Figure 9, while the presser fingers 176 will drop upon the next succeeding cap, as shown in the same figure, to hold the succeeding cap against the stops 173a. The cap being removed from the chute by the container will be urged to the leveled position shown in Figure 9 by the wiper tongue 181, which continues to bear upon the top wall of the cap until the forward portion of the cap comes into contact with the endless belt 32 hereinafter described.

It will be understood that if the belt 32 is not provided, presser 175 and tongue 181 will normally serve to adequately level the cap upon the mouth of the container.

It will also be observed that the centering arms 196 are of sufficient vertical height adjacent their pivots that the cap cannot slide sidewise during any portion of its above described movement from the chute.

Another advantageous feature of our cap feed control described above is that both of the elements 175 and 180 bear upon the cap merely on transverse lines. Thus, the cap is free to rock on a transverse axis while moving from the position of Figure 7 to that shown in Figure 9, but because the elements 175 and 180 bear upon the caps along fairly long transverse lines, the cap cannot tilt along a line longitudinally of the chute 28 during its removal. It will be noted that during the greater portion of the movement of the cap from the Figure 7 position to that of Figure 9, the bottom edge of the skirt of the cap is only supported on a line extending longitudinally of the chute 28, i. e., by the inner edges of the ledges 147a and by the leading portion of the container mouth, it being necessary to cut away the bottom wall of such a chute to permit the container to contact with the cap skirt. Hence, if the cap is of substantial diameter, it is very apt to tilt on a line longitudinally of the chute unless equalized downward pressure is exerted upon it at this time at points on its top wall adjacent its skirt. The width of the bearing surfaces of the elements 175 and 180 provides such contact. The centering arms 196 assist in preventing tilting.

It will be observed from Figure 7 that the lower end of chute 28 is at such height with respect to the surface of conveyor 30 that the lower edge of the skirt of the lowermost cap will contact with the mouth M of a container well down along the mouth wall and that the cap will therefore, until it is sealed, be tilted forwardly upon the container mouth. This is the most desirable position in which to deliver a cap to an endless belt capper.

In order to further level the cap under the container and also prevent it from being jarred loose prior to the time that it is moved to a sealed position upon the container mouth, the endless belt 32, preferably of fabric or other bodily flexible material, will contact with the cap just prior to the time that the wiper 180 drops off the trailing portion of the cap. As best indicated in Figure 10, the belt 32 moves about a roll or pulley 200 carried by a bracket 201. As shown in Figure 4b, the lower run of the belt 32 is normally horizontal, but the diameter of roll 200 is sufficiently large that the forwardly and downwardly tilted cap moves easily beneath the roll and belt 32 to lift the roll as shown in Figure 10. After the cap has moved from beneath the roll the belt will exert sufficient force to hold the cap in the same slightly tilted or "leveled" position. The fact that the roll 200 is bearing upon at least the leading portion of the top wall of the cap at the time that the wiper 180 moves off the trailing portion prevents the cap being tilted upwardly at its leading portion when the wiper 180 finally contacts only with the extreme trailing portion of the cap, as will occur when the cap finally moves clear of the tongue 181.

In order to prevent the containers from being tilted backwardly by their initial engagement with the lowermost cap in the chute, at the point illustrated in Figure 7, we provide the centering and holding structure 31 best illustrated in Figure 4b. This structure is particularly desirable in the handling of full containers having a small base.

The container centering mechanism is fully disclosed in our above-mentioned divisional application, filed November 6, 1944, but may be generally described for purposes of the present description as comprising two sets of driven belts 210 positioned on each side of the longitudinal center line of the container supporting conveyor 30. As shown in Figure 4b, each set of belts comprises an upper belt and a lower belt adapted to contact with a container at vertically spaced points on the side wall of the container. The centering structure is supported on the superstructure bars 59.

Referring to Figures 4a, 4b, 11 and 12, the leveling and holding belt 32 and sealing belt 33 operate together, with the leveling belt surrounding the sealing belt as generally disclosed in said Steward patent. The sealing belt 33 is of a construction similar to that disclosed in the Stewart patent and comprises pairs of links 270 and 271 pivotally supported from the plate 59 of the super-structure by the rod 69 and shaft 68, respectively. As is fully described in said Stewart patent, the links 270 have a shaft 272 journalled at their lower ends which carries an idler sprocket 273 while the links 271 have a shaft 274 journalled between their lower ends to support a sprocket 275. Shaft 274 carries a smaller sprocket 276 which is driven by means of a sprocket chain 277 which extends upwardly to engage a corresponding sprocket wheel 278 on the shaft 68. Shaft 68 in turn carries a second sprocket driven by a chain 279 which encircles the sprocket wheel 280 on the shaft 65. As best shown in Figure 2, shaft 65 carries a pinion 280a which meshes with a pinion 281 on the shaft 56 and shaft 56 is driven from the speed reduction mechanism 51 through the drive chain 54.

Sprocket 275 drives the capping belt 33 to move the same about the idler sprocket 273. The lower ends of the links 270 and 271 are connected by a shoe 283 against the under surface of which the lower run of the capping chain 33 moves. The shoe 283 therefore holds the lower run of the chain in firm contact with the caps of con-

tainers moving beneath the same. The under surface of shoe 283 is downwardly bowed to a slight extent and is held in the position illustrated in Figures 4a and 4b by a spring 286 mounted upon a bolt 287 pivotally connected to the shoe as indicated at 288, one end of the spring bearing upon a bracket 289 fixed to the superstructure bars 60. As is fully described in said Stewart patent, a container moving beneath the belt 33 may raise the shoe 283 slightly, but the only movement which the shoe can have is along a diagonal line extending upwardly toward the outfeed end of the capping chain 33. That is, the shoe and chain 33 will swing bodily about the pivots 68 and 69 and upwardly toward the outfeed end of the capping mechanism.

The leveling belt 32 is preferably of fabric or other bodily flexible material in order that the cap tops will not be marred by the same. Belt 32 moves about the pulley 200 positioned immediately adjacent the cap applying mechanism 29 and also about a pulley 34, with the major portion of its runs in contact with the corresponding runs of the capping chain 33. The pulley 200 is carried by a shaft 296 journalled in the bracket 201 and bracket 201 is pivoted upon a pin 297 extending through the lower end of a hanger 298 hooked over super-structure rod 69 and suitably held against swinging. In order that the pulley 200 may have a limited upward swinging movement on hanger 298, an arm 299 extends upwardly from bracket 201 between collars spaced on a stud 300 fixed to hanger 298. A spring may be provided behind the inner collar which is slidable on the stud. However, the outer collar is threaded upon the stud. The downward swinging movement of the bracket 201 carrying pulley 200 is limited by a bolt 301 threaded in the lower portion of bracket 298.

The above adjustable mounting of roll 200 will be so set that the lower run of belt 32 from roll 200 to the lower point of capping element 33 will be normally horizontal. Hence, roll 200 will be slightly lifted by an advancing cap as shown in Figure 10 and will therefore exert a downward holding force on the cap before the latter leaves the wiper 180, while belt 32 will exert a corresponding force until sealing occurs. In view of this, a cap cannot fall from a container and, in fact, the belt 32 will tend to actually level the cap upon the container mouth, that is bring its top wall parallel with the edge of the container mouth. This downward pressure also prevents the container from being upset.

The roll 34 at the outfeed end of belt 32 is rotatably mounted between the lower ends of a yoke 305 pivoted to the super-structure 57 at 306. Above the pivot point yoke 305 has a coil spring 307 connected thereto so that the roll 34 exerts tension upon the leveling belt 32. The tension of the spring 307 may be exerted by means of the adjusting arrangement generally indicated at 308. The fact that the lower run of belt 32 is held under tension by roll 34 causes the cap to be firmly held upon the container until it moves beneath the downwardly bowed portion of capping chain 33.

As is described in our above-mentioned divisional application, filed November 6, 1944, the leveling belt 32 is driven by means of its contact with the capping element or chain 33. Roller 35 is of sufficient weight to maintain the proper contact between the belt and the chain and is journalled in a yoke 311 pivoted on the superstructure at 312.

When the container moves beneath the downwardly bowed portion of the capping chain 33, shown at the right hand portion of Figure 4a, the cap will be moved to a firmly seated position upon the container due to the fact that the lower run of the capping chain is arranged at the proper height to squarely seat the cap upon a container of the minimum possible height of that particular size. Containers taller than this minimum height will act upon the lower run of chain 33, through belt 32, to lift the shoe 283 to swing on the links 270 and 271 in a clockwise direction as viewed in Figure 4a and against the action of the spring 286. In other words, the capping shoe 283 and in fact the entire capping chain, will move diagonally along a line inclined upwardly toward the outfeed end of the capping mechanism.

The fabric belt 32 moving at the same linear speed as the capping belt 33 insures that caps will not be marred by the metal links of the chain 33. In order that the belt 32 will be held properly centered upon chain 33 a pair of vertically mounted sheaves 315 are positioned adjacent the outfeed end of the belt. These sheaves are carried on links 316 horizontally pivoted at 317 upon the ends of downwardly projecting and adjustably mounted arms 318.

As best shown in Figure 1, the mouth 320 of a water jet pipe 321 may be positioned adjacent the outfeed end of each pair of centering belts 210 so as to remove from these belts any container contents which may drop upon them from an over-filled container.

It will be noted that all driven elements of the machine which contact with containers or caps move at the same speed with the possible exception of the disc 24 which supplies caps to the passageway 25. It is at least necessary that the centering and holding belts 210, container supporting conveyor 30, the leveling and holding belt 32 and capping chain 33 move at the same linear speed in order to prevent containers from being upset.

The general operation of the entire apparatus has been set forth above in the opening portion of the specification and the detailed operation of each mechanism has been set forth in connection with the description of the construction of such mechanism.

It will be understood that while the various mechanisms disclosed herein operate together with a high degree of efficiency, nevertheless the separate mechanisms may be used with other mechanisms for operating upon caps and containers.

Subject matter disclosed but not claimed herein may be claimed in our above-mentioned divisional application, Serial No. 562,110, filed November 6, 1944.

The terminology used in the specification is for the purpose of description and not limitation, the scope of the invention being indicated in the claims.

We claim:

1. The combination in a capping apparatus, of an inclined cap chute, container advancing means movable beneath said chute, a stop device at the lower end of said chute adapted to be contacted by the skirt of a cap, movable means to bear upon the top wall of a cap to hold the latter downwardly against said stop, said means comprising a pair of transversely spaced fingers extending substantially parallel to said chute, said fingers being pivoted to the chute adjacent their upper

ends to have their lower and free ends bear upon opposite portions of the cap top wall along a line transversely of the cap chute, and means to level a cap upon a container comprising a member pivoted on said chute between said fingers and including a cap engaging face arranged at an angle to said chute.

2. The combination in a capping apparatus, of an inclined cap supply chute, means to advance a container beneath the cap chute, an upwardly projecting cap skirt engaging stop rigidly secured to the lower end of said chute, means to hold a cap in engagement with said stop and guide it from an inclined position to a level position upon a container moving beneath the chute including a planar cap engaging portion extending at an angle to the chute and to the container advancing means, and resilient means to hold said last-named means against the cap.

3. The combination in a capping apparatus, of an inclined cap supply chute, means to limit the downward movement of caps in said chute, a member pivoted above said chute including transversely spaced fingers adapted to contact with the top wall of the cap and normally lie in a plane substantially parallel to such wall of the cap, and a second member pivoted above said chute and normally lying at an angle to said first member, said second member being adapted to normally contact with the lowermost cap in the chute at a point in advance of said first member.

4. The combination in a capping apparatus, of an inclined cap supply chute, means to limit the downward movement of caps in said chute, a member pivoted above said chute including transversely spaced fingers adapted to contact with the top wall of the cap and normally lie in a plane substantially parallel to such wall of the cap, a second member pivoted above said chute and normally lying at an angle to said first member, said second member being adapted to normally contact with the lowermost cap in the chute at a point in advance of said first member, said second member having a transverse width substantially corresponding to the width of the area occupied by the fingers of said first member.

5. The combination in a container capping apparatus, of a base, moving means carried by said base to support a container, a cap feeding element positioned on said base above said container supporting means and including a horizontal passageway adapted to initially receive caps at one end thereof, and a downwardly inclined passageway joining the other end of the horizontal passageway to receive caps from the latter, the downwardly inclined passageway having means at its outlet end to apply a cap to a container moving beneath the same, said element being pivoted on said base at a point adjacent the cap receiving end of the horizontal passageway to enable said outlet end to be vertically adjusted with respect to the container supporting means without varying the cap receiving end of the horizontal passageway.

6. The combination in a capping apparatus, of an inclined cap chute, container advancing means movable beneath said chute, a rigid stop device extending upwardly from the lower end of said chute adapted to be contacted by the skirt of a cap, pivoted means extending transversely of the cap including a portion substantially parallel with the surface of the cap chute to bear upon the top wall of a cap to hold the latter downwardly against said stop, said pivoted means including an outer portion extending at an angle to the surface of the cap chute to bear upon a cap moving over said stop device, and resilient means to urge said pivoted means toward the surface of said cap chute.

7. The combination in a capping apparatus, of an inclined cap chute, container advancing means movable beneath said chute, a rigid stop device extending upwardly from the lower end of said chute adapted to be contacted by the skirt of a cap, pivoted means extending transversely of the cap including a portion substantially parallel with the surface of the cap chute to bear upon the top wall of a cap to hold the latter downwardly against said stop, said pivoted means including an outer portion extending at an angle to the surface of the cap chute to bear upon a cap moving over said stop device, resilient means to urge said pivoted means toward the surface of said cap chute, and spring-pressed arms pivoted on a vertical axis at each side of the lower end of said chute to exert lateral pressure upon a cap moving over said stop.

8. In combination, an inclined cap chute, stop means to limit the movement of the lowermost cap in the chute, means to move a container beneath the chute, leveling means carried by and movable with respect to the chute to level upon a container a cap withdrawn from the chute, said leveling means including a face extending substantially parallel with the surface of the cap chute to bear upon the top wall of a cap to hold the latter downwardly against said stop, said leveling means also including an outer portion extending at an angle to the surface of the cap chute to bear upon a cap moving over said stop means, means moving with the container moving means to engage a cap withdrawn by a container before such cap moves out of contact with said outer portion of said leveling means, and means associated with said last-named means to move the cap to sealed position upon the container.

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